REMARKS

By the present amendment, Claims 1-13, 15 and 16 have been amended, Claim 14 has been cancelled, and Claims 17-21 have been newly added. Claims 1-13 and 15-21 remain pending in the present application. Claims 1, 18, and 20 are independent claims.

Applicant respectfully submits that the amendments to the claims are fully supported by the original disclosure, and introduce no new matter therewith. Applicant respectfully requests reconsideration and allowance in view of the foregoing amendments and the following remarks.

Applicant appreciates the courtesies extended to Applicant's representative during the personal interview held February 23, 2005. The present response summarizes the substance of the interview. At the interview Applicant's representative discussed a proposed amendment. Proposed amended independent Claim 1 recited a self-locking linear adjustment mechanism including a locking tumbler; an adjustment vernier interconnected with the locking tumbler, the adjustment vernier having two ends and being configured to effect a vernier adjustment between the two ends; two end adapters with an inner end with an internal adapter; two roll pins configured to secure the locking tumbler axially in place; two locking skirts each having an inner end with an internal shoulder; two precision balls; two springs each having an end, each spring being configured to bias apart the inner end of a locking skirt and the inner end of an end adapter; two locking splines; two index pins; and two guide shafts, wherein the locking skirts are each configured to fit around one locking spline, index pin, and guide shaft

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assembly, and the self-locking linear adjustment mechanism has a dual function self-locking feature with the use of a single tool.

Applicant's representative presented arguments traversing the rejection of Claims 1-16 under 35 U.S.C. § 112, first and second paragraphs, and the rejection of Claims 1-4, 6-8, 11, 12, and 14 under 35 U.S.C. § 102(b) as being anticipated by Suzuki (U.S. Patent No. 4,813,810). The Examiner maintained the rejection of Claims 1-16 under 35 U.S.C. § 112, first paragraph based on the term "self-locking". The Examiner indicated that a change of the term "self-locking" to --locking-- could overcome this rejection. With respect to the rejection of Claims 1-4, 6-8, 11, 12, and 14 under 35 U.S.C. § 102(b), the Examiner agreed that Suzuki discloses a coupling mechanism and not an axial vernier adjustment mechanism. A formal agreement as to the patentability of the claims was withheld by the Examiner pending a thorough review of arguments and proposed amendment presented at the interview, a thorough review of this amendment, and a further update search.

Claims 1-16 are rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the enablement requirement because the claims refer to a "self-locking" adjustment mechanism and it is unclear as to how the mechanism is self-locking when it requires manual assistance to lock and unlock a locking tumbler. The cancellation of Claim 14 renders this rejection moot with respect to this particular claim.

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Applicant respectfully submits that original Claims 1-16 fully satisfied the specific requirements of 35 U.S.C. § 112, first paragraph because the claimed "self-locking" adjustment mechanism ***was*** described in the specification, as originally filed, in such a way as to enable one skilled in the linear adjustment device art to make and/or use the invention.

The self-locking linear adjustment mechanism described throughout the specification is used to make and hold precise adjustments in aircraft control systems, as well as other applications. For example, to affect a lock with linear control rods using typical linear adjustment devices, multiple steps or actions are required to lock such devices once adjustment is made. Among these is the precise application of torque to a series of jam nuts to remove free play from the threads; the installation of locking elements and safety wire on these jam nuts; the use of a tab washer which has an ID tab that keys to the male thread and an array of external tabs one of which to be bent to engage a slot in the face of the rod body and one of the remaining external tabs bent to engage the flats of the adjustment nut; and some existing locking linear adjustment devices utilize a clamping action to introduce high friction into the adjusted threads that is relied upon as a lock. All of these linear adjustment locking schemes have two common things in common: (1) they depend on multiple actions by a skilled technician that are subject to human error; and (2) they depend on friction at some level to maintain a locked condition.

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The specified self-locking linear adjustment mechanism provides a positive lock through a shear load path not dependent on friction and removes all free play from threads in one simple quarter turn motion of the locking tumbler. As clearly described on pages 24-26 of the present application, the self-locking linear adjustment mechanism includes springs 112 which perform two functions. Each spring 112 biases apart the inner end of a locking skirt 110 and an inner end of a corresponding end adapter 116. When in the locked position the springs 112 force the engagement of the internal splines of the adjustment vernier 104 and the external splines of the locking splines 114. The spring load simultaneously drives the locking skirts 110 into the conical lead in distal end ramps of the tubular members 105 of the adjustment vernier 104. This action expands the slotted ends of the tubular members 105 of the adjustment vernier 104 using this mechanical advantage to force a tight engagement of its external threads with the internal threads of the rod end adapters thereby eliminating all axial free play in both directions that may exist due to manufacturing tolerances within the threaded engagement.

This constitutes the dual function locking features of this mechanism, positive rotational locking to secure the adjusted position and positive axial locking for the elimination of axial free play in the locked position. The linear adjustment mechanism enables a user to effect a vernier adjustment with a unique dual function self-locking feature. The only tool required for operation is a common Allen wrench to engage or disengage the locking mechanism. This simple locking feature has the advantage that it

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only requires one hand to operate which makes its use ideal for confined spaces or locations that are awkward to reach with both hands.

To unlock the linear adjustment mechanism a user simply rotates the locking tumbler 102, approximately 90 degrees, with an Allen wrench. This drives the steel balls 103 outward pushing the locking splines 114, disengaging the mated splined locks, and relieving the radial pressure on the conical lead in distal end ramps of the tubular members 105 of the adjustment vernier 104 in one motion while compressing the two coil springs 112. The adjustment vernier 104 is then free to rotate to achieve the desired length change in the given application. Friction within an unloaded and disengaged mechanism is low enough to allow rotation by finger pressure only. No other wrenches are required.

The specified self-locking linear adjustment mechanism provides dual function positive locking of linear adjustment and axial free play in one easy step. The mechanism eliminates the possibility of loose jam nuts that allow free play and thread wear. The mechanism has no preloading torque requirements or quality assurance witnessing of torque application. There is no reliance on friction as a locking feature. No keyway type locking devices or lock wire is required. Rod end alignment issues that may exist with traditional designs are eliminated. No loose pieces that may be forgotten, overlooked, or lost by technicians are utilized. The locking mechanism is internal and protected from damage. The locking mechanism may be located at any point along the length of a rod for ease of access.

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Applicant respectfully submits that one skilled in the linear adjustment device art making a comparison of the specified linear adjustment mechanism with prior art linear adjustment devices would merit the description of the specified linear adjustment mechanism as a "self-locking" linear adjustment mechanism.

Furthermore, the term "self-locking", as defined in WordNet® 2.0 (August 2003), means "locking automatically when closed". This definition of the term self-locking accurately describes the specified self-locking mechanism because once the locking tumbler is positioned in the lock position by a common Allen wrench, the springs within the specified self-locking linear adjustment mechanism automatically provide positive rotational locking to secure the adjusted position and positive axial locking for the elimination of axial free play in the locked position. The specified self-locking linear adjustment mechanism provides a positive lock through a shear load path not dependent on friction and removes all free play from threads in one simple quarter turn motion of the locking tumbler.

However, in order to expedite prosecution of this matter, Applicant has amended Claims 1-13, 15 and 16 to change the term "self-locking" to --locking--. Applicant respectfully submits that amended Claims 1-13, 15, 16, and newly added Claims 17-21, meet the specific requirements of 35 U.S.C. § 112, first paragraph, and requests reconsideration and withdrawal of this rejection of Claims 1-16 under 35 U.S.C. § 112, first paragraph.

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Claims 1-16 are rejected under 35 U.S.C. § 112, second paragraph, as being incomplete for allegedly omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. The Examiner noted that none of the claims contain a structural relationship between the two springs and the two index pins with the rest of the invention. The Examiner also noted that there is insufficient antecedent basis for "the internal spine" in Claim 5, "the central member" in Claim 15, and "the distal end ramp" in Claim 15. The cancellation of Claim 14 renders this rejection moot with respect to this particular claim.

Applicant has amended Claim 1 to structurally relate the claimed elements, and has amended Claims 8, 11 and 15 to depend from Claim 7. Claim 1 has also been amended to incorporate the subject matter set forth in dependent Claim 14. Newly added independent Claim 18 corresponds to amended Claim 1 further incorporating the allowable subject matter of Claim 9. Newly added independent Claim 20 corresponds to amended Claim 1 further incorporating the allowable subject matter of Claim 13. Newly added dependent Claims 17, 19, and 21 set forth the dual locking feature of the locking linear adjustment mechanism (see pages 24-26 of the present application).

Amended independent Claim 1 recites a locking linear adjustment mechanism. The locking linear adjustment mechanism includes a locking tumbler, an adjustment vernier, two end adapters, two roll pins, two precision balls, two springs, and two locking splines. The locking tumbler has an axis and two ends. Each end has a recess defined therein. The adjustment vernier has a center, at least one internal spline, and two

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threaded ends of different pitch. The adjustment vernier is interconnected with the locking tumbler, and is configured to effect a vernier linear adjustment. The two end adapters each have an inner threaded end and an outer end. Each inner end is interconnected to the adjustment vernier, and each outer end is configured to be joined to any device requiring linear adjustment. The two roll pins are configured to secure the locking tumbler axially in place. The two locking skirts each have an inner end with an internal shoulder and an outer end with a raised spherical shoulder. The two springs each have two ends. Each spring is configured to bias apart the inner end of one of the two locking skirts and the inner end of one of the two end adapters. The two locking splines are configured to lock rotation of the adjustment vernier when engaged with the internal spline of the adjustment vernier.

The locking tumbler is configured to fit between the locking skirts and to rotate about the axis of the locking tumbler, thereby causing the two precision balls to move outward and inward from the center of the adjustment vernier. The recesses of the tumbler are each configured to enable insertion of an operation tool. The two precision balls are configured to be driven outward and inward by the locking tumbler against a spring force to lift and drop the locking splines in and out of engagement with the internal spline of the adjustment vernier. The two end adapters are configured to fit around the adjustment vernier with the interconnected locking tumbler; each locking skirt is configured to fit around one locking spline, index pin, guide shaft, and spring, with the precision balls positioned on either side of the locking tumbler forming an assembly. The

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locking linear adjustment mechanism has a dual function locking feature with the use of a single tool.

Applicant respectfully submits that amended Claims 1-13, 15 and 16, and newly added Claims 17-21, meet the specific requirements of 35 U.S.C. § 112, second paragraph, and requests reconsideration and withdrawal of this rejection of Claims 1-16 under 35 U.S.C. § 112, second paragraph.

Claims 1-4, 6-8, 11, 12, and 14 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Suzuki. The cancellation of Claim 14 renders this rejection moot with respect to this particular claim. Claims 5, 9, 10, 13, 15 and 16 are not rejected on prior art and are presumed to be allowable if rewritten to overcome the rejections of 35 U.S.C. § 112, first and second paragraphs. Applicant notes with appreciation the conditional indication of allowable subject matter.

The Examiner asserts that Suzuki discloses "a locking linear adjustment mechanism (see Fig. 57)". As clearly described between pages 26 and 27 of the present application, the specified locking linear adjustment mechanism is capable of effecting locked incremental length adjustments as small as one ten thousandth of an inch. Applicant respectfully submits that Suzuki nowhere teaches or reasonably suggests a locking linear adjustment mechanism. Suzuki plainly describes his invention as a coupling device, ***not*** a vernier adjustment mechanism, in which a shaft or pipe is coupled to a boss member in which balls, disposed in radial holes in the boss, engage a groove on the shaft or pipe. A set ring slidable on the boss selectively forces engagement of the

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balls in the groove. The set ring is biased in both directions toward the apertures. The bias can be provided by one or two spring rings engaging two oppositely inclined surfaces on either the boss or the set ring or by a coil spring set between tow spring supports that are each moved by both the boss and the set ring.

The coupling device shown in Fig. 57 of Suzuki is a coupling device and only a coupling device. The function of the Fig. 57 coupling device is to join two pipes to allow flow of some medium through the coupled pipes. In is not, nor does it contain any feature that could be construed to be an adjustment device. It contains no threads of any type to make a connection or hold an adjustment. There are no means provided for making adjustment to length, in a vernier fashion as set forth in Claims 1-16. Further, the Figs. 57 coupling device does not contain any splines for engagement to prevent axial rotation across the device. Another distinct difference between the claimed locking linear adjustment mechanism and the Fig. 57 coupling device is that the balls utilized by Suzuki are loaded in shear as they form the coupling lock. In the claimed adjustment mechanism, the balls are loaded in compression as they serve to lift and lower the mechanism in and out of locked mode against the forced of the compression springs. There is no possible way to apply the Suzuki coupling device to applications in aircraft systems for which the claimed adjustment mechanism is intended.

It is well known that for a reference to anticipate a claim under 35 U.S.C. § 102(b) there "must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention" (see

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Scripps Clinic & Research Foundation v. Genentech Inc., 18 USPQ 2d 1001, 1010 (Fed. Cir. 1991).

Applicant respectfully submits that Suzuki fails to anticipate a locking linear adjustment mechanism including a locking tumbler having an axis and two ends each having a recess defined therein; an adjustment vernier having a center, an internal spline, and two threaded ends of different pitch, the adjustment vernier being interconnected with the locking tumbler, and being configured to effect a vernier linear adjustment; two end adapters each having an inner threaded end and an outer end, each inner end being interconnected to the adjustment vernier, and each outer end being configured to be joined to any device requiring linear adjustment; two roll pins configured to secure the locking tumbler axially in place; two locking skirts each having an inner end with an internal shoulder and an outer end with a raised spherical shoulder; two precision balls; two springs each having two ends, each spring being configured to bias apart the inner end of one of the two locking skirts and the inner end of one of the two end adapters; two locking splines configured to lock rotation of the adjustment vernier when engaged with the internal spline of the adjustment vernier; two index pins; and two guide shafts, wherein the locking tumbler is configured to fit between the locking skirts and to rotate about the axis of the locking tumbler, thereby causing the two precision balls to move outward and inward from the center of the adjustment vernier, and the recesses of the tumbler are each configured to enable insertion of an operation tool; the two precision balls are configured to be driven outward and inward by the locking tumbler against a

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spring force to lift and drop the locking splines in and out of engagement with the internal spline of the adjustment vernier; the two end adapters are configured to fit around the adjustment vernier with the interconnected locking tumbler; each locking skirt is configured to fit around one locking spline, index pin, guide shaft, and spring, with the precision balls positioned on either side of the locking tumbler forming an assembly, and wherein the locking linear adjustment mechanism has a dual function locking feature with the use of a single tool, as Claims 1-13 and 15-21 require.

Applicant respectfully requests reconsideration and withdrawal of the rejection of Claims 1-4, 6-8, 11 and 12 under 35 U.S.C. § 102(b) as being anticipated by Suzuki.

For the foregoing reasons, Applicant respectfully submits that the present application is in condition for allowance. If such is not the case, the Examiner is requested to kindly contact the undersigned in an effort to satisfactorily conclude the prosecution of this application.

Respectfully submitted,

Richard C. Litman
Registration No. 30,868
(703) 486-1000

RCL:tcs

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